

of the respective planar yokes and which are disposed to face each other, extending in an axial direction, and a cylindrical ring provided on outer peripheral edges one of said planar yokes;

a rotor being concentrically disposed within the stator yoke and being adapted for repetitive rotational movement within a set angular range, the rotor having a number N of magnetic poles;

an armature being constituted by installing a coil formed by winding a magnetic wire in a coil receiving section shaped like an annular recess formed by said planar yokes, said polar teeth, and said cylindrical ring of said stator yoke; and

a stator assembly which has flanges with bearing provided on both end surfaces of said armature and in which a rotor provided with a magnet for a magnetic field composed of a permanent magnet being installed to face said polar teeth of said stator with a minute gap provided therebetween;

wherein a number of said polar teeth equals [a] the number N of rotor magnetic poles.

REMARKS

This is in response to Office Action of Paper No. 3, dated March 28, 2000. Applicant has amended claim 1 and the Title. No new matter has been added. Applicant respectfully requests reconsideration of the application in light of the referenced amendments and in view of the following remarks.

The Title:

The Office Action states that the title of invention is not descriptive. The title has been amended herein as suggested by the Examiner to provide a more descriptive indication of the invention.

The Claims Are Patentable Over Komatsu and Fujitani:

In the Office Action, claims 1, 3, 7, 9, and 10 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Komatsu (U.S. Pat. No. 4,656,381) in view of Fujitani et al. (U.S. Pat. No. 4,891,567). Specifically, the Office Action states that Komatsu discloses a claw pole type actuator having a single phase structure as shown in Figure 25. The Office Action states that the structure shown in Komatsu Figure 25 has a stator yoke with a substantially circular planar yoke, and polar teeth that axially protrude from the inner peripheral edges of the respective planar yokes and which are disposed to face each other, extending in an axial direction. The Office Action states that although Komatsu does not disclose that the number of said polar teeth

equals a number of rotor magnetic poles, Fujitani supplies this teaching and it would have been obvious at the time the invention was made to modify the claw pole type actuator of Komatsu and provide it with a number of polar teeth equal to a number of rotor magnetic poles.

Reconsideration of this rejection is respectfully requested. Both disclosures attempt to solve very different problems from that described in Applicant's specification. The Komatsu disclosure teaches an arrangement of a stator and rotor that eliminates the problem of dead start-up in a motor where the pole of the rotor is aligned to the pole of the stator such that a starting torque cannot be developed. The arrangement in Fujitani is used to provide a high efficiency brushless DC motor that is inexpensive and eliminates complicated winding of the stator yoke. Both of these disclosures describe electromagnetic machinery which rotates continuously in one direction. Although the direction of rotation may be reversed, the devices described in the cited references are in sharp contrast to the invention of the applicant which is an actuator designed for repetitive rotational movements in a set angular range. Therefore, it is not obvious for one to combine the Komatsu and Fujitani references which are directed to motors to arrive at the applicant's invention of an actuator.

Applicant has amended claim 1 to better define an actuator as an electromagnetic machine performing a repetitive rotational movements between two angular positions. Applicant's invention also recites a rotor that is concentrically disposed within the stator yoke. This difference in structure distinguishes Applicant's invention from that disclosed in Fujitani where the rotor surrounds the stator. Moreover, Applicant's claim 1 recites an invention that is clearly different than the electric motors described in each reference that rotate continuously in one direction. A reference is not available under 35 U.S.C. § 103 if it is not within the field of the inventors' endeavor and was not directly pertinent to the particular problem with which the inventor was involved. King Instrument Corp. v. Otari Corp., 226 U.S.P.Q. 402 (Fed. Cir. 1985). If a reference is not within a field of the inventor's endeavor, one looks at whether the field of the reference is reasonably pertinent to the problem the inventor is trying to solve. Ryco, Inc. v. Ag-Bag Corp., 8 U.S.P.Q.2d 1323 (Fed. Cir. 1988). In this case, Applicants' endeavor is the construction of electronic actuators. The art cited by the Office Action pertains to electric motors, which is a different field of endeavor. It is not reasonable for an inventor of electronic actuators to look to the field of electric motors to solve the problem of providing a detent torque to reposition the rotor of an electronic actuator when current is reversed in the windings. These references supply no teaching with respect to the detent torque that is used to reverse the rotation of the rotor. The scope of prior art is limited to that which would have been considered

by those endeavoring to solve the problem that the patent solves. Atlas Powder Co. v. E.I. Dupont de Nemours & Co., 221 U.S.P.Q. 426 (Tex. 1983).

Moreover, the Fujitani and Komatsu disclosures do not show an electromechanical machine that is capable of repetitive rotational movement within a set angular range. There is no description of starting torque or rated torque in relation to the detent torque. For these reasons, neither reference teaches the claimed subject matter.

Therefore, claim 1 is patentable over Komatsu in view of Fujitani. It is, therefore, respectfully submitted that claims 2-10, depending from claim 1, are also patentable for the same reasons.

Claim 2 is Patentable Over Komatsu in View of Fujitani and in Further View of Haydon:

In the Office Action, claim 2 is rejected under §103(a) as being unpatentable over Komatsu in view of the Fujitani, and in further view of Haydon (U.S. Pat. No. 3,495,113). Specifically, the Office Action considers the Komatsu and Fujitani references to disclose a claw pole type actuator. Moreover, the Office Action states that it would have been obvious to use the teachings of Haydon to construct a stator yoke in which the planar yoke and polar tooth are combined into one piece.

Reconsideration of the rejection is respectfully requested. It is submitted that the Haydon reference does not provide any additional teaching that would suggest to one skilled in the art to create the invention as recited by Applicant's claims 1 or 2. The Haydon reference is directed to a DC motor that has stator pole pieces that interlock to permit proper spacing and orientation. The Haydon reference does not discuss a detent torque or cogging torque that is used to return the rotor to a set position after deenergization of the stator coil. In the Haydon reference, the polar teeth are spaced such that the rotor always stops at the same position; however, the rotor is set for continuous rotation in one direction and not set for repetitive rotational movement within a set angular range. For these reasons, the Haydon reference fails to supply the additional teachings that would make obvious the combination of the disclosures of Fujitani and Komatsu.

Therefore, claim 1 is patentable over Komatsu in view of Fujitani and in further view of Haydon. It is, therefore, respectfully submitted that claim 2, depending from claim 1, is also patentable for the same reasons.

Claims 4 and 5 are Patentable Over Komatsu in View of the Fujitani and in Further View of Takeuchi et al.:

In the Office Action, claims 4 and 5 were rejected under §103(a) as being unpatentable over Komatsu, in view of the Fujitani et al., and in further view of Takeuchi et al. (U.S. Pat. No. 4,899,073). Specifically, the Office Action considers the Komatsu and Fujitani references to disclose a claw pole type actuator. Moreover, the Office Action states that Takeuchi discloses the teaching of using a stopper to restrict rotation of the rotor and that the stopper is incorporated into the actuator for purpose of providing an improved motor detention torque and drive torque.

It is respectfully submitted that the Takeuchi reference fails to supply the additional teachings needed to render obvious the applicant's invention as recited in claims 1, 4, and 5. Specifically, Takeuchi discloses a three position rotary actuator having separately wound stator poles in contrast to the construction of the stator yoke of the applicant's which is a claw pole type arrangement with annular windings. Takeuchi does not teach or discuss timing excitation in the stator coil with the angular position of the rotor to achieve a detent torque that repositions the rotor when the stator is deenergized. Takeuchi's teachings are focused to providing an improved drive in a three position rotational actuator rather than increasing detention torque. Moreover, in the applicant's method of positioning the rotor, current is directed through the stator in one direction to produce a magnetic field in one pole. The rotor is rotated towards that pole and may be held in place by the detent torque once the coil is de-energized. This is different from Takeuchi where the stator has four poles and a pair of four poles is energized to position the rotor at a given position. Given the differences between Takeuchi and the structure recited in Applicant's claim 1, it is respectfully submitted that it would not be obvious to combine the three references to arrive at the applicant's invention.

Therefore, claim 1 is patentable over Komatsu in view of Fujitani and in further view of Takeuchi. It is, therefore, respectfully submitted that claims 4 and 5, depending from claim 1, are also patentable for the same reasons.

Claim 6 is Patentable Over Komatsu in View of Fujitani and in Further View of Yamaguchi:

In the Office Action, claim 6 was rejected under §103(a) as being unpatentable over Komatsu in view of Fujitani, and in further view of Yamaguchi et al. (U.S. Pat. No. 5,373,207). It is respectfully submitted that the Yamaguchi disclosure fails to supply the teachings needed to render the applicant's invention as recited in claims 1 and 6 obvious. The Yamaguchi

disclosure is directed to a DC brushless motor. The rotor of the motor is formed with a center of mass that is positioned off the rotational axis to cause vibrations. The motor is used as a vibrating alarm or signal for paging devices. The reference fails to supply any teaching or suggestion with respect to a rotor being adapted for repetitive rotational movement within a set angular range.

Therefore, claim 1 is patentable over Komatsu in view of Fujitani and in further view of Yamaguchi. It is, therefore, respectfully submitted that claim 6, depending from claim 1, is also patentable for the same reasons.

Claim 8 is Patentable Over Komatsu in View of Fujitani and in Further View of Morril:

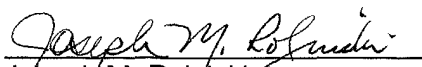
In the Office Action, claim 8 was rejected under §103(a) as being unpatentable over Komatsu in view of Fujitani and in further view of Morril (U.S. Pat. No. 5,260,620). In the Office Action the Morril reference is relied upon for describing a AC asynchronous induction motor having stator teeth shaped with increasing air gaps on both sides of the center line of each tooth. However, Morril teaches use of this technique to increase the magnetic reluctance between each of the teeth and the rotor so as to produce a more efficient motor by balancing harmonics of flux. However, the applicant increases the air gap in the circumferential direction toward the ends of the poles so that the phase of stability point of the detent torque agrees with that of the excitation torque. This permits a stable and broader repetitive motion range to be secured. The Morril reference fails to supply any additional teaching with respect to a rotor that is adapted for repetitive rotational movement within a set angular range. The Morril reference does not supply any new teachings to make up for the deficiencies already shown with respect to Komatsu and Fujitani.

Therefore, claim 1 is patentable over Komatsu in view of Fujitani and in further view of Morril. It is, therefore, respectfully submitted that claim 8, depending from claim 1, is also patentable for the same reasons.

CONCLUSION

In view of the amendments and remarks contained herein, it is respectfully submitted that the application is in condition for allowance and notification to that effect is earnestly solicited. The Examiner is encouraged to contact the undersigned by telephone if any other matters need to be resolved prior to allowance.

Respectfully submitted,



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